2020 MASSACHUSETTS CLEAN ENERGY

Industry Report

[bw] RESEARCH PARTNERSHIP

MASSACHUSETTS CLEAN ENERGY CENTER®

Since 2010 MassCEC has invested over **$360M** and attracted over **$2B** in private and federal capital.

Awarded **$128M** for technology innovation and company growth, leveraging **$1.2B** of third-party investment

Awarded **46,000+** clean energy projects: **157 MW** of solar and **244 MW** of clean heating and cooling

Supported over **900** companies

Enabled an **89%** increase in clean energy jobs

ABOUT MASSCEC

The Massachusetts Clean Energy Center (MassCEC) is a quasi-public state agency whose mission is to accelerate the clean energy and climate solution innovation that is critical to meeting the Commonwealth's climate goals, advancing Massachusetts' position as an international climate leader while growing the state's clean energy economy.

MassCEC utilizes innovative programming to advance the clean energy industry in Massachusetts, including incentives for clean energy technology installations, financing for early stage companies and technology development, as well as investments in training programs to build a clean energy workforce. MassCEC serves as a test bed and support center for the clean energy technology sector, providing assistance to enable companies to access capital and other vital growth resources.

MassCEC fosters collaboration among the industry, state government, research universities, and the financial sector to advance the state's clean energy economy. We partner with a diverse range of stakeholders across the industry, especially the companies and researchers innovating in clean transportation, high-performance buildings, net zero grid, and offshore wind.

MassCEC constructed and operates the Wind Technology Testing Center in Charlestown and the New Bedford Marine Commerce Terminal. Massachusetts Energy and Environmental Affairs Secretary Kathleen Theoharides chairs MassCEC's board of directors.

For an overview of MassCEC's accomplishments over the last decade, see our Ten Year Impact Report.[1]

[1]https://www.masscec.com/masscecs-ten-year-impact-report

NOTE FROM THE CEO

STEPHEN PIKE

Each year the Massachusetts Clean Energy Center (MassCEC) measures the development of the Commonwealth's clean energy industry, and 2019 marked the 10th consecutive year of growth. Unfortunately, despite this strong performance, 2020 was an entirely different story. The COVID-19 pandemic caused clean energy businesses to shed a net 13,900 jobs through September. While the industry added jobs over the summer, the modest pace of those gains points to a slower-than-hoped-for rebound. But rest assured, the industry will rebound. Massachusetts has long been a leader in clean energy innovation, deployment, and job creation. This past decade established a strong foundation on which to rebuild, and with the Baker-Polito Administration's commitment to achieving net zero greenhouse gas (GHG) emissions by 2050, Massachusetts is well positioned to see those modest summer gains accelerate in the months and years to come.

A quick look at that foundation: As of the last quarter of 2019, Massachusetts' clean energy economy had grown to almost 114,000 workers across the state, an increase of just over 2,100 jobs over the previous year, representing 2.5% of all job growth in the state during 2019. Clean energy employment has increased by 89%, or roughly 54,000 workers, over the last decade.

Clean energy workers are well-paid: A recent study sponsored by Environmental Entrepreneurs, the American Council on Renewable Energy, and the Clean Energy Leadership Institute found clean energy job wages in Massachusetts are 23% higher than the state's overall median wage. Those workers, the products they build and services they provide are the cornerstones of Massachusetts' $14 billion clean energy industry, an industry that supports an additional 175,237 indirect and induced jobs across the statewide economy, adding $25 billion to statewide Gross State Product.

The Commonwealth's economic recovery and its net zero target will both benefit from our residents and workers accessing clean energy and clean energy jobs. MassCEC will continue to prioritize equal access to clean energy benefits across each of our four focus areas — high efficiency buildings, clean transportation, offshore wind, and net zero grid. Housing and offshore wind are particularly well-suited to achieve the dual purposes of providing clean energy as well as job opportunities to all our residents. Building and retrofitting cleaner, healthier, more comfortable, and more resilient housing at the scale necessary to achieve net zero by 2050 requires a significantly larger workforce than currently exists. Growing this workforce will require investment in preparing new workers for a low carbon economy, as well as retraining existing workers.

Likewise, offshore wind offers tremendous new employment opportunities but will require concerted efforts to develop the workforce required to launch this new industry in the U.S. Once constructed, the offshore wind farms will provide significant local clean energy to businesses and homes across the Commonwealth and will be mainstays of economic activity in the region in the coming decades.

This report, and those that preceded it, highlight the need for a more concerted effort to include underrepresented and underserved residents and workers in the industry's growth. Some of these residents and workers, such as Hispanic/Latinx, Asian, and veterans, have entered the Massachusetts clean energy workforce in higher percentages than the Massachusetts workforce overall, while Black and female workers continue to be underrepresented in the industry. This presents a clear challenge to all of us in the clean energy economy to work harder to ensure that the economic benefits of the growth of the industry are shared more equitably across racial, ethnic, and gender lines.

To be sure, the road ahead presents significant challenges. But in each of those challenges lies great opportunity. Critical investments the Commonwealth makes today in clean energy market development, technology development, and job training will help reduce the cost of the transition to a low carbon economy and accelerate our pace toward that important goal, while driving robust and equitable economic growth throughout the Commonwealth. MassCEC looks forward to working with you to realize the promise of the clean energy economy in delivering the benefits of clean energy and clean energy jobs to every corner of the Commonwealth and to all Massachusetts residents.

Stephen Pike, CEO

A NOTE ON COVID-19 IMPACTS

Due to the COVID-19 pandemic that struck the nation in early 2020, most industries, including clean energy, have shed jobs as a result of business closures and social distancing measures. It is estimated that from March through September 2020, the Massachusetts clean energy industry lost about 13,900 net workers.[2]

Some clean energy jobs may rebound, but the economic ripple effects of these job losses will likely continue through 2021 and beyond. As Massachusetts begins recovery efforts from COVID-19, there are opportunities for the clean energy industry to be part of the solution, and provide benefit alongside greenhouse gas emission reductions to the state and region.

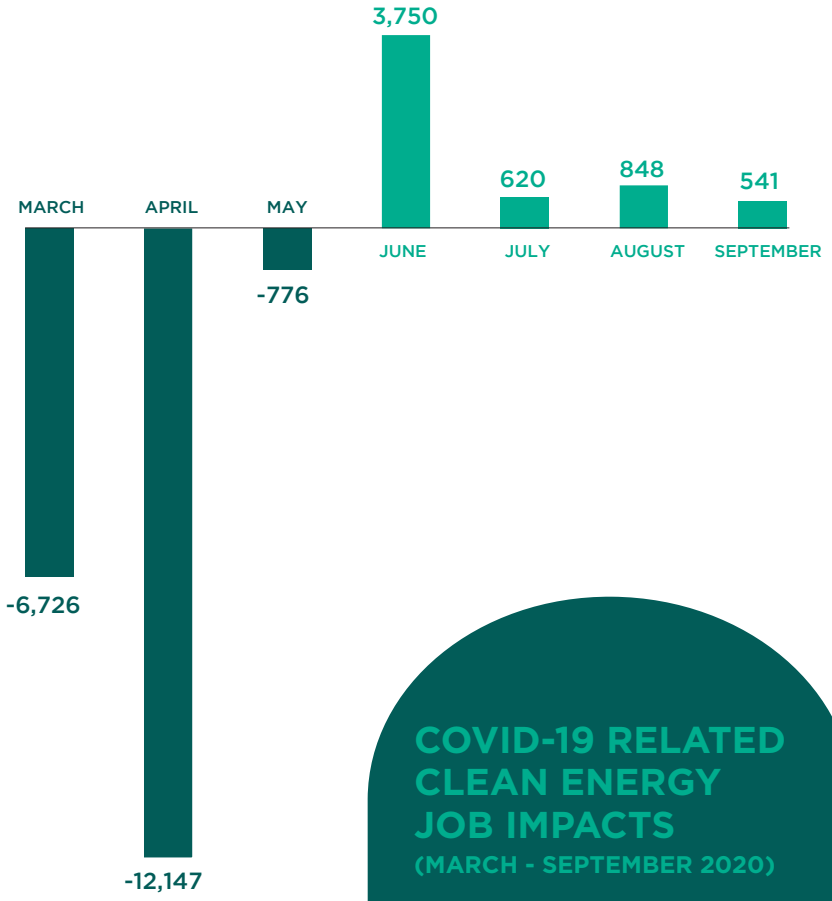
The 2020 job numbers represented in this report were collected at the end of 2019, thus providing a baseline of Massachusetts clean energy employment data before the pandemic. Where COVID-19 related job data are available, the report provides a snapshot of how the clean energy industry has been impacted. BW Research Partnership has more detailed COVID-19 job impact data.[3] It is anticipated that the 2021 report will provide a more robust overview of the COVID-19 impacts experienced in 2020.

[2,3] bwresearch.com/covid

IMPACT OF COVID-19 ON CLEAN ENERGY EMPLOYMENT

From March to May 2020, the clean energy industry in Massachusetts shed just over **19,600** jobs – more than the sum of annual growth over the last five years – due to the economic impacts of COVID-19. The majority of job losses were in April, at the peak of the economic shutdown in Massachusetts. From June to September 2020, clean energy businesses added roughly **5,750** clean energy jobs, resulting in a net loss of **13,890** workers as of September 2020.

CLEAN ENERGY JOBS LOST AND GAINED BETWEEN MARCH AND SEPTEMBER 2020



COVID-19 RELATED CLEAN ENERGY JOB IMPACTS

(MARCH - SEPTEMBER 2020)

TOTAL JOBS LOST - 19,649
TOTAL JOBS GAINED - 5,759
NET JOBS LOST - 13,890

2020 MASSACHUSETTS CLEAN ENERGY Industry Report Highlights[4]

[4]The numbers represented in the 2020 Massachusetts Clean Energy Industry Highlights are as of December 2019 and before COVID-19.

A DECADE OF CLEAN ENERGY INDUSTRY GROWTH

through December 2019

113,968 clean energy workers in MA, a **1.9%** increase from the 2019 Report

89% job growth since 2010, adding nearly **54,000** new workers

Clean energy jobs represent over **3%** of all jobs in MA, and **3.5%** of all clean energy jobs in the United States

60% of clean energy workers in MA are employed by small businesses (10 or fewer workers)

Clean energy companies represent nearly **$14.1 billion** in Gross State Product (GSP), up by about **$5 billion** since 2013

175,000 additional indirect and induced jobs and **$25 billion** in additional GSP supported by the clean energy industry

About 13,900 net jobs lost between March – September 2020 due to COVID-19 economic impacts

FASTEST GROWING SUB-SECTORS

between 2019-2020 reports

Wind jobs grew by **7%**

Smart Grid/ Microgrid/ Other Grid grew by around **4%**

Efficient lighting jobs grew by more than **3%**

ECONOMIC CONTRIBUTION ANALYSIS

DECEMBER 2019

This report includes strict definitions for clean energy businesses and jobs. Only those workers who are directly supporting clean energy activities, such as conducting research, manufacturing products, performing installations, or repairing and maintaining clean energy systems are included as clean energy workers. However, the impact of the industry is significantly greater than these "direct" jobs alone.

The **113,968 DIRECT CLEAN ENERGY JOBS** in Massachusetts support an additional:

49,737 INDIRECT JOBS

(those outside of the clean energy sector that provide critical supply chain goods and services)

Based on this analysis, the **MASSACHUSETTS CLEAN ENERGY INDUSTRY** is responsible for a total economic contribution of:

289,205
jobs

$39.1 billion
in MA GSP

$1.77 billion
in state and local taxes

$447 million
in federal taxes on production and imports

125,500
INDUCED JOBS
(those that result from increased spending in the economy)

MASSACHUSETTS IS A LEADER

Photo from David Borrus, Pile Drivers and Divers Local 56

#1 for clean energy workers per capita in the U.S. by E2[5] (2020)

[5] Environmental Entrepreneurs (E2), the American Council for an Energy-Efficient Economy (ACEEE), and the U.S. Green Building Council (USGBC)

#1 on the clean energy Community Power Scorecard for the 4th straight year by the Institute for Local Self-Reliance (2020)

#2 for energy efficiency in the U.S. by ACEEE (2020)

#1 for median clean energy wage by E2 (2020)

#2 for Innovation overall by Bloomberg, for the 2nd year in a row (2020)

#2 Boston named city for clean energy by ACEEE (2020)

#4 in Leadership in Energy and Environmental Design (LEED) by USGBC (2019)

#4 for total solar workers in the U.S. by the Solar Foundation (2019)

#7 for total clean energy workers in the U.S. by E2 (2020)

22,000+
Electric vehicles sold in MA since 2011

107,000+
solar projects in MA

$900 million
spent on energy efficiency, generating over
$2.9 billion
in benefits (2019)

TOTAL CLEAN ENERGY JOBS

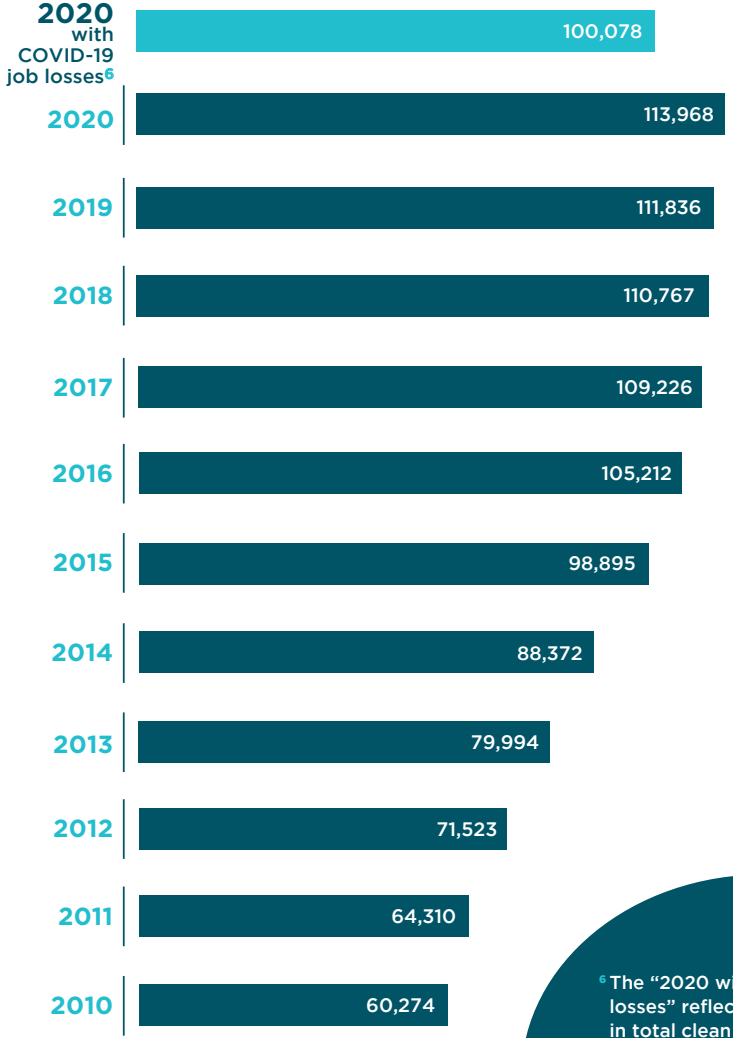
This report defines a clean energy worker as a person who spends some portion of their time working in renewable energy, energy efficiency, alternative transportation, or other carbon management technologies.

Between the beginning of 2010 and December 2019, the clean energy industry in Massachusetts added almost **54,000** jobs, which accounts for **10.3%** of all jobs created in the state during that time.

The economic impact of COVID-19 in 2020 has been significant, with a **12.2%**[6] reduction of clean energy jobs in MA, as well as a **9.8%**[7] reduction in overall jobs in the state.

89%
GROWTH SINCE 2010

TOTAL CLEAN ENERGY EMPLOYMENT 2010-2020



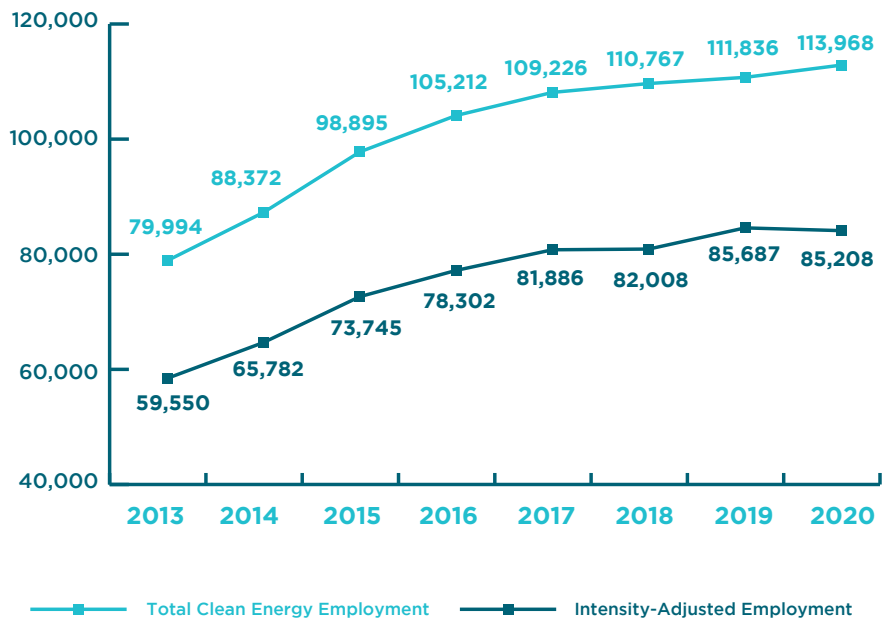
[6] The "2020 with COVID-19 job losses" reflects the net reduction in total clean energy jobs due to losses from March through September 2020.

[7] lmi.dua.eol.mass.gov/LMI/NewsRelease/CurrentMonthUnemployment

FULL-TIME EMPLOYMENT EQUIVALENT JOBS

Applying an intensity metric that approximates the equivalent of full-time employment (FTE) shows that while overall jobs increased by **1.9%**, the FTE equivalent jobs fell slightly by **0.6%** from the 2019 report to the 2020 report.

In Massachusetts, **75%** of clean energy workers spend the "majority" or "all of their time" working in clean energy, compared to an average of **60%** nationally.



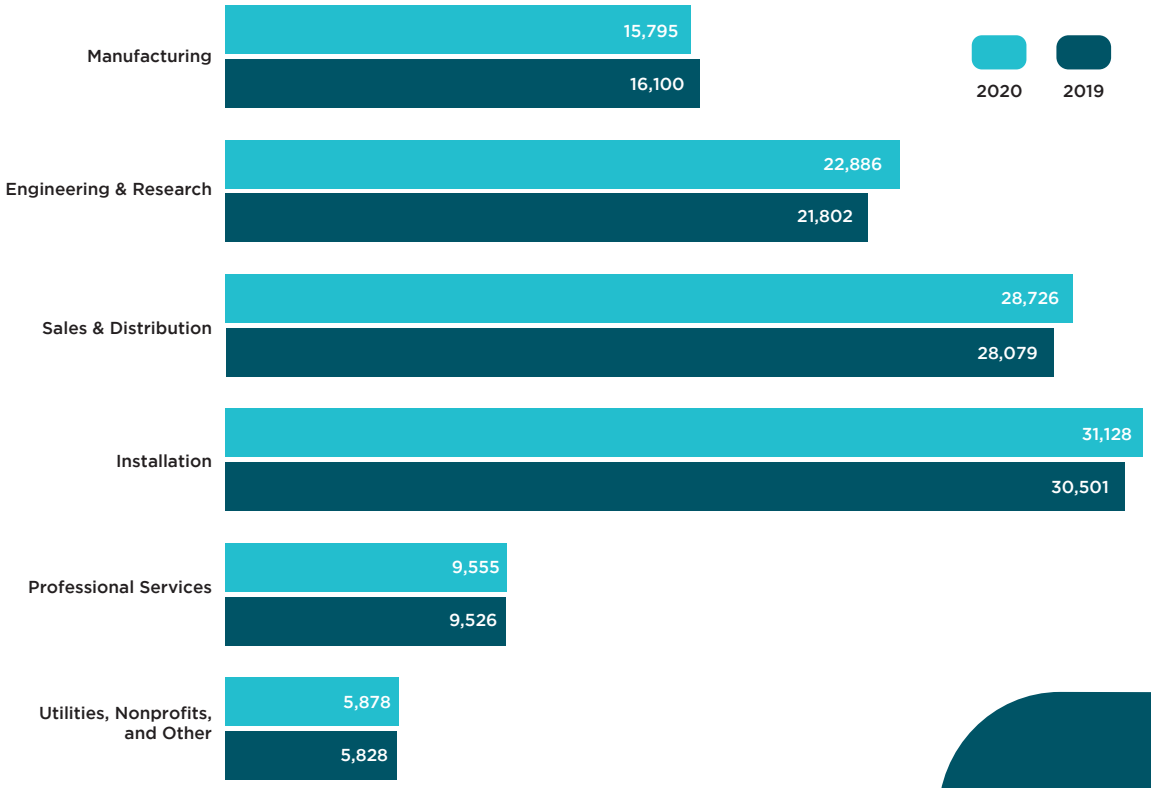
INTENSITY-ADJUSTED EMPLOYMENT[8]

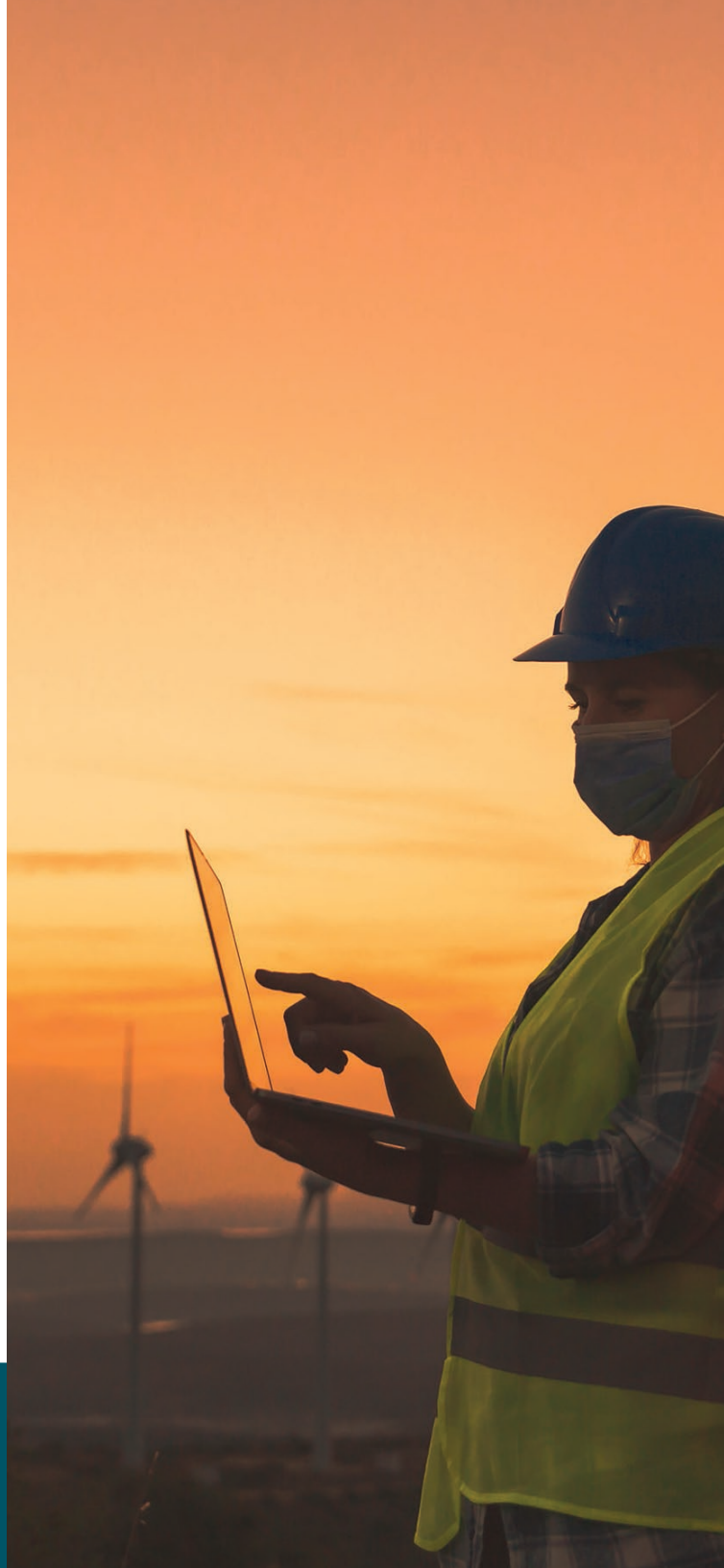
[8] The methodology for intensity-adjusted employment has been revised to reflect the inclusion of a revenue-adjusted weighting. Data for prior years was updated using the new methodology.

CLEAN ENERGY JOBS BY VALUE CHAIN

Engineering and Research saw the largest growth rate of almost **5%** from the 2019 to 2020 reports, followed by Sales & Distribution with over **2%** growth.

The decline in Manufacturing jobs can be partially attributed to a **0.4%** overall decline in manufacturing jobs across Massachusetts.[9]

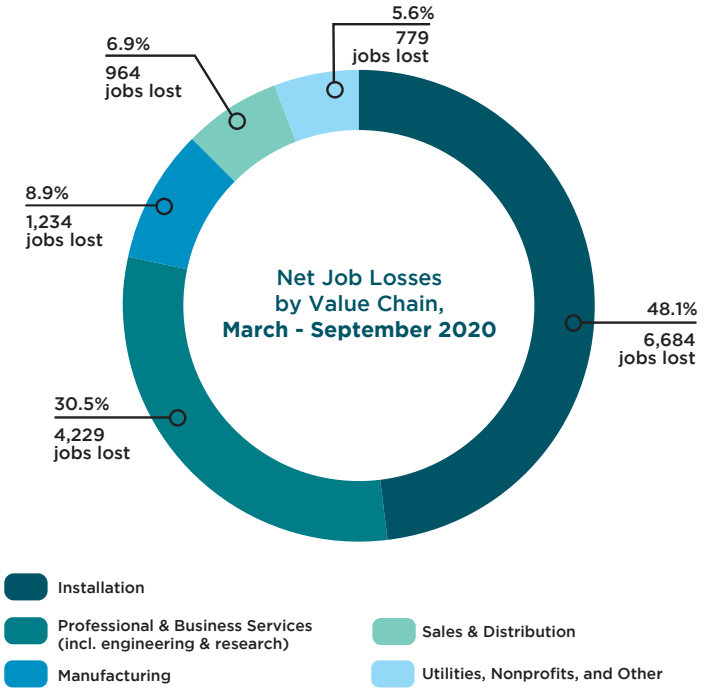




[9] Source: Emsi. 2019.3

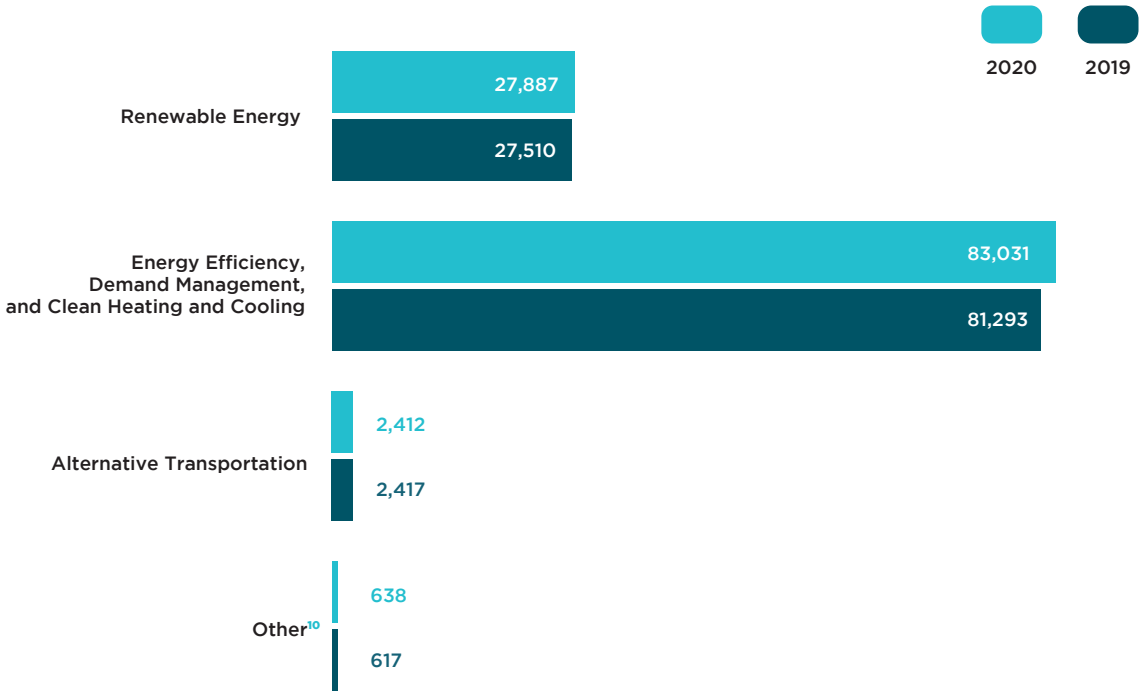
IMPACT OF COVID-19 ON CLEAN ENERGY JOBS BY VALUE CHAIN

Installation and Professional & Business Services accounted for **78.6%** of COVID-19 related net job losses between March and September 2020. There were almost **6,700** Installation jobs lost, followed by over **4,200** Professional & Business Services jobs.



CLEAN ENERGY JOBS BY SECTOR

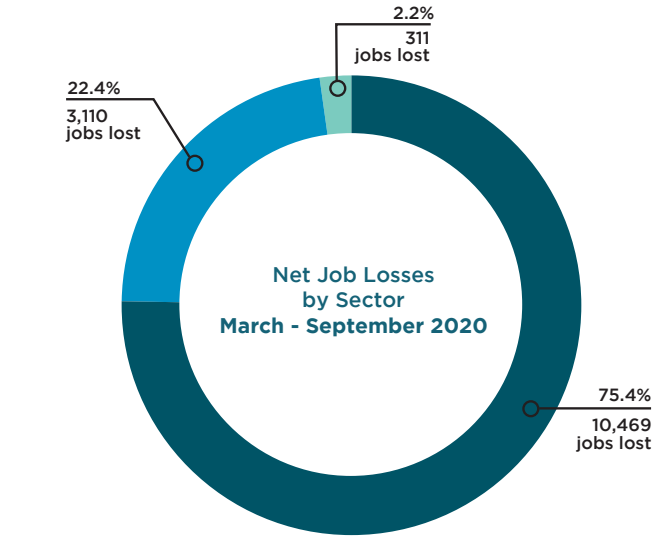
Energy Efficiency, Demand Management, and Clean Heating and Cooling remains the largest clean energy sector, growing steadily by over **2%** from the 2019 to 2020 reports. Jobs in the Other[10] category saw the greatest proportional growth, at **3%**, while Renewable Energy employment grew by about **1%** from the 2019 report.



[10] The Other category consists of all jobs that could not be classified into one specific clean energy technology because the work overlaps with multiple categories – for example, greenhouse gas management or accounting.

IMPACT OF COVID-19 ON CLEAN ENERGY JOBS BY SECTOR

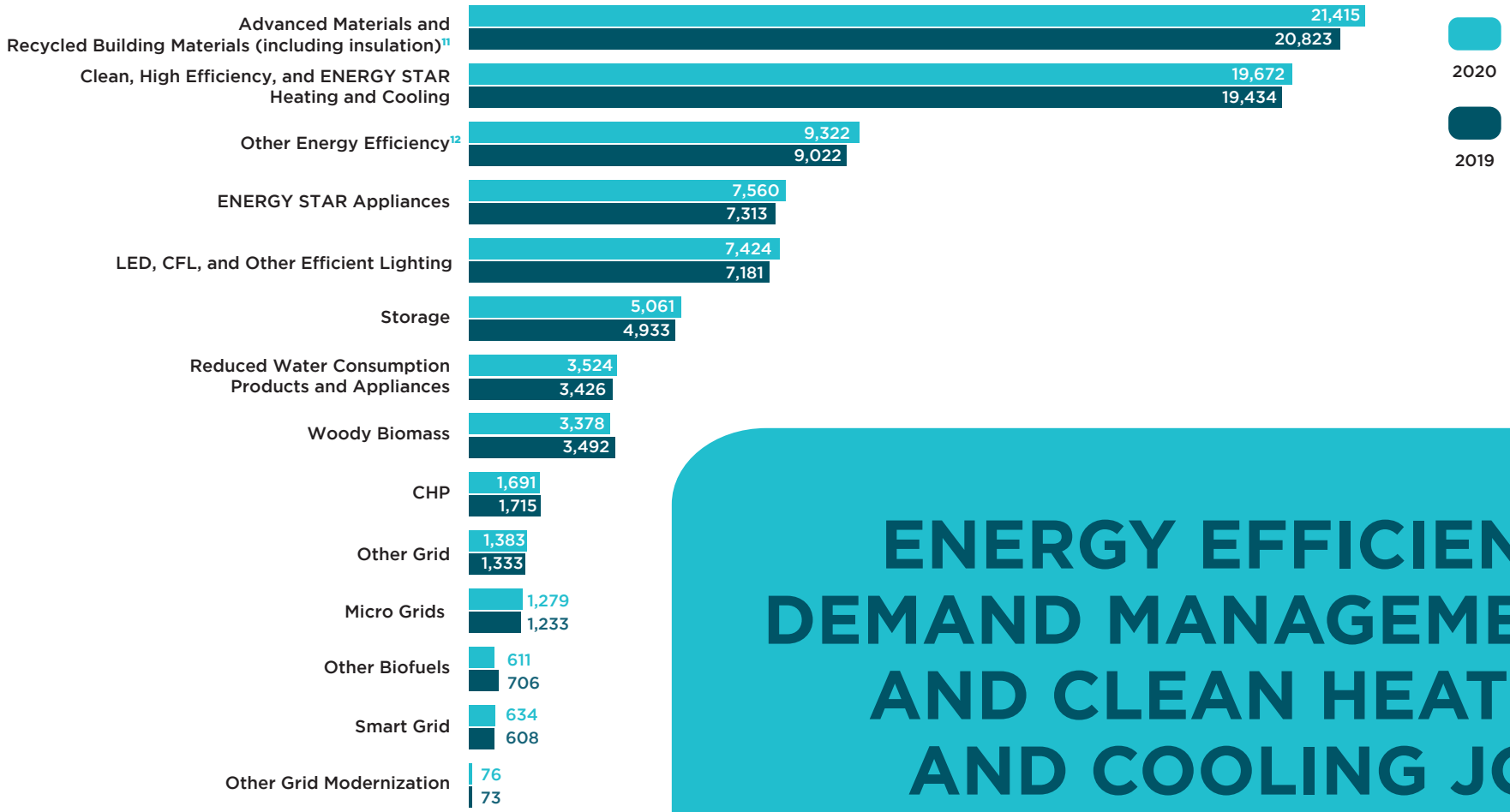
The impact of COVID-19 was experienced the most by the Energy Efficiency, Demand Management, and Clean Heating and Cooling sector, which lost almost **10,500** jobs and accounted for **75%** of overall net job losses from March through September 2020. Renewable Energy businesses also shed roughly **3,100** workers, accounting for just over **22%** of total job losses during that same time.



Energy Efficiency, Demand Management, and Clean Heating and Cooling

Renewable Energy

Alternative Transportation



ENERGY EFFICIENCY, DEMAND MANAGEMENT, AND CLEAN HEATING AND COOLING JOBS

Energy Efficiency, Demand Management, and Clean Heating and Cooling jobs make up the largest portion of clean energy jobs within Massachusetts. Advanced Materials and Recycled Building Materials[11] saw the largest increase, with almost **600** jobs added between the 2019 and 2020 reports, followed by Other Energy Efficiency[12] with **300** additional jobs.

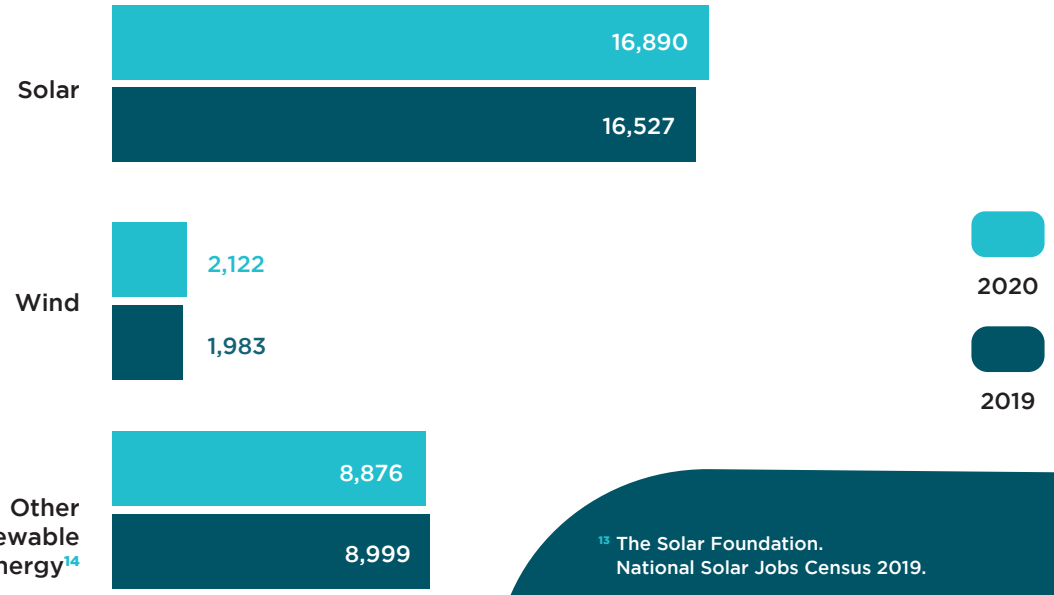
[11] Advanced Materials and Recycled Building Materials includes doors, windows, air sealing, floor, wall, or piping insulation and any additional building envelope materials that represent advances in efficiency over traditional materials.

[12] Other Energy Efficiency includes variable speed pumps, other design services, software, energy auditing, rating, monitoring, metering, leak detection, LEED certification, phase-change materials, or all other activities not specific to a detailed technology.

RENEWABLE ENERGY JOBS

The solar industry continues to maintain the largest number of jobs in the Renewable Energy sector and is beginning to rebound following a decline in employment starting in 2017. Between the 2019 and 2020 reports, solar businesses created about **360** new jobs for a growth rate of over **2%**. Massachusetts continues to be a national solar industry leader and is ranked **4th** for the most solar workers and **6th** for the most solar workers per capita.[13]

Wind energy generation employment has increased by roughly **1,100** jobs since 2015, for a growth rate over **106%**. Between the 2019 and 2020 reports, the wind industry saw the highest relative increase in new jobs, at **7%**.



[13] The Solar Foundation. National Solar Jobs Census 2019.

[14] Other Renewable Energy includes Geothermal, Bioenergy/Biomass, Low-Impact Hydro, and all other electric power generation detailed technologies that are not defined by the categories presented or cannot be assigned to a single category.

ALTERNATIVE TRANSPORTATION JOBS

The Massachusetts Electric Vehicle workforce saw job growth from the 2017 to 2019 reports, creating **637** jobs for a growth rate of **38%**, but largely remained flat between the 2019 and 2020 reports.

[15] Other Alternative Transportation includes jobs focused on technologies such as biodiesel for on-road vehicles.

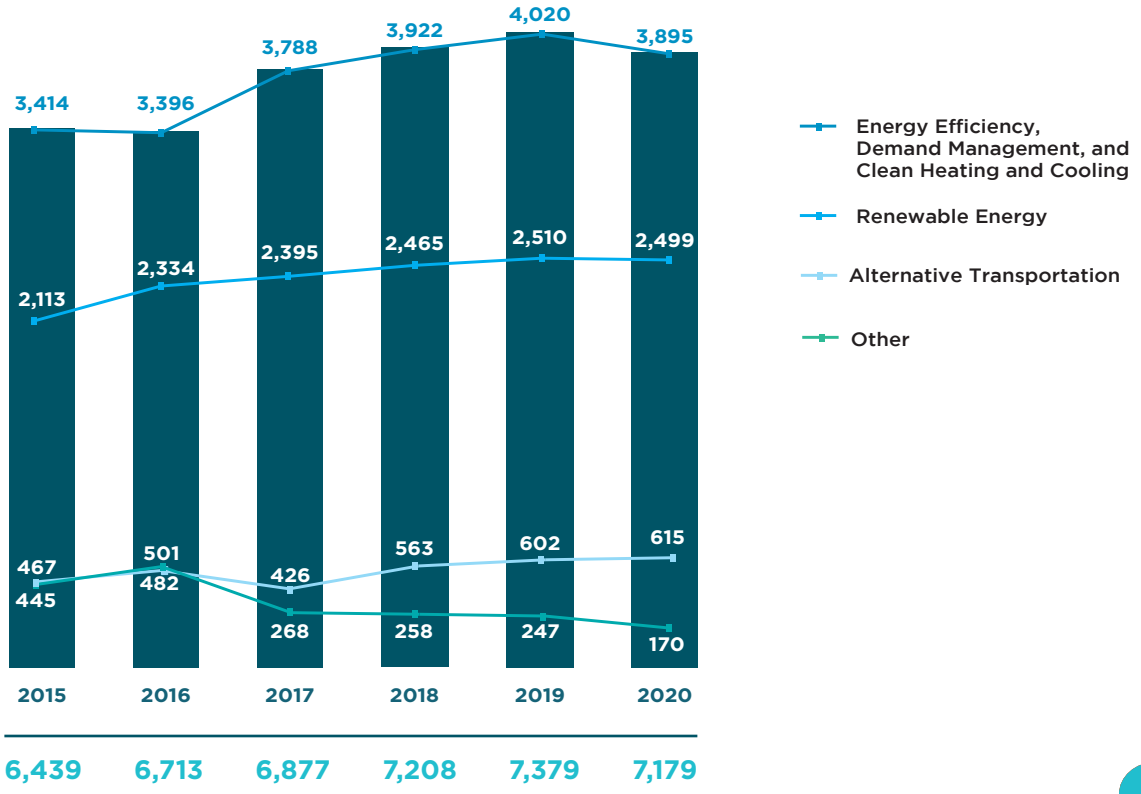
CLEAN ENERGY BUSINESSES

The overall number of clean energy businesses in Massachusetts decreased slightly by **2.7%** relative to the year before. The majority **(54%)** of the businesses remain focused on Energy Efficiency, Demand Management, and Clean Heating and Cooling.

Small businesses (1 to 10 employees) employ over **60%** of all clean energy workers, followed by mid-size businesses (11 to 49 employees), which employ over **25%** of clean energy workers.

7,179
clean energy businesses in 2020

MASSACHUSETTS CLEAN ENERGY BUSINESS



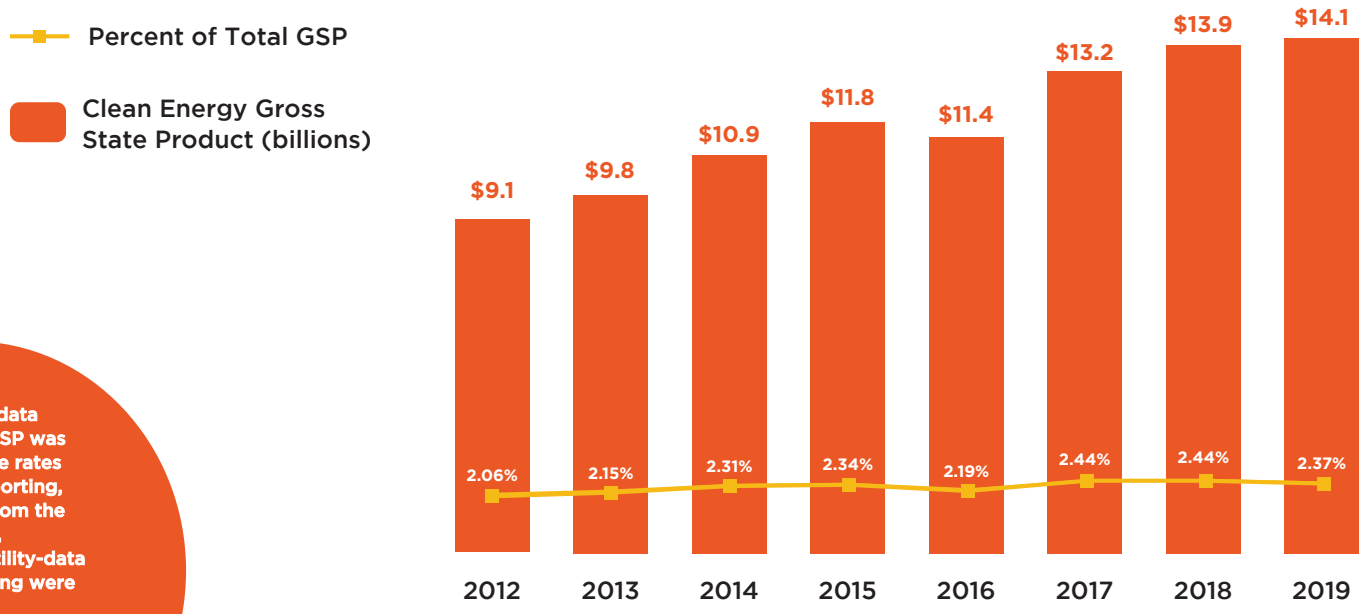
	2015	2016	2017	2018	2019	2020
TOTAL:	6,439	6,713	6,877	7,208	7,379	7,179

CLEAN ENERGY GROSS STATE PRODUCT

The clean energy industry contributed **$14.1 billion**, or roughly **2.4%**, to the Commonwealth's Gross State Product (GSP) in 2019.[16]

The industry's GSP has increased by **54%** from 2012 to 2019. This outpaces overall growth in Massachusetts GSP, which grew by **34%** over the same period.

Clean energy GSP increased by **1.3%** (over $177 million) between 2018 and 2019.

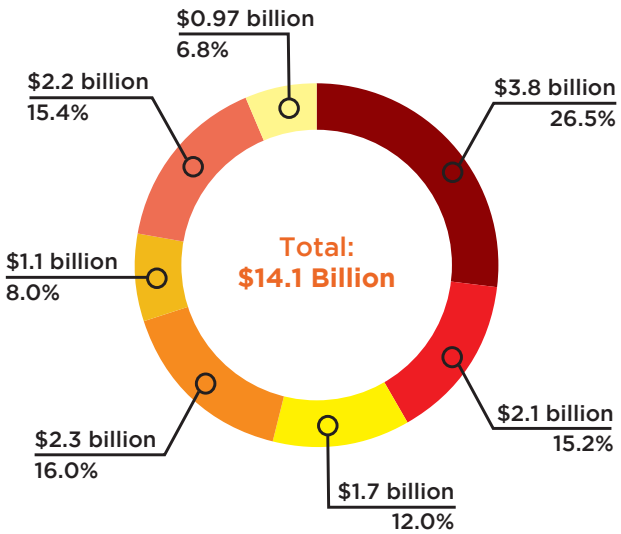


[16] 2019 data is the most recent data available. The clean energy GSP was derived from survey incidence rates and proportional revenue reporting, together with existing data from the Bureau of Economic Analysis, calculated by NAICS code. Utility-data and state government spending were included as direct inputs.

CLEAN ENERGY GROSS STATE PRODUCT BY VALUE CHAIN

GSP in the Engineering & Research category experienced the greatest growth, increasing by more than **17%** over the last year, followed by the Sole Proprietor category with over **14%** growth.

Manufacturing, Sales & Distribution, and Professional Services categories declined by roughly **$0.2B** in 2019.



- Manufacturing
- Engineering & Research
- Sales & Distribution
- Installation & Maintenance
- Professional Services
- Other
- Sole Proprietors

CLEAN ENERGY WORKER DEMOGRAPHICS

The representation of workers by demographic group as a percentage of the clean energy workforce remained roughly unchanged from the 2019 to 2020 reports. While the Massachusetts clean energy industry is somewhat diverse, it is imperative that the industry continue to provide and support opportunities for women and people of color.[17,18,19]

[17] Emsi data for age, race, ethnicity, gender.

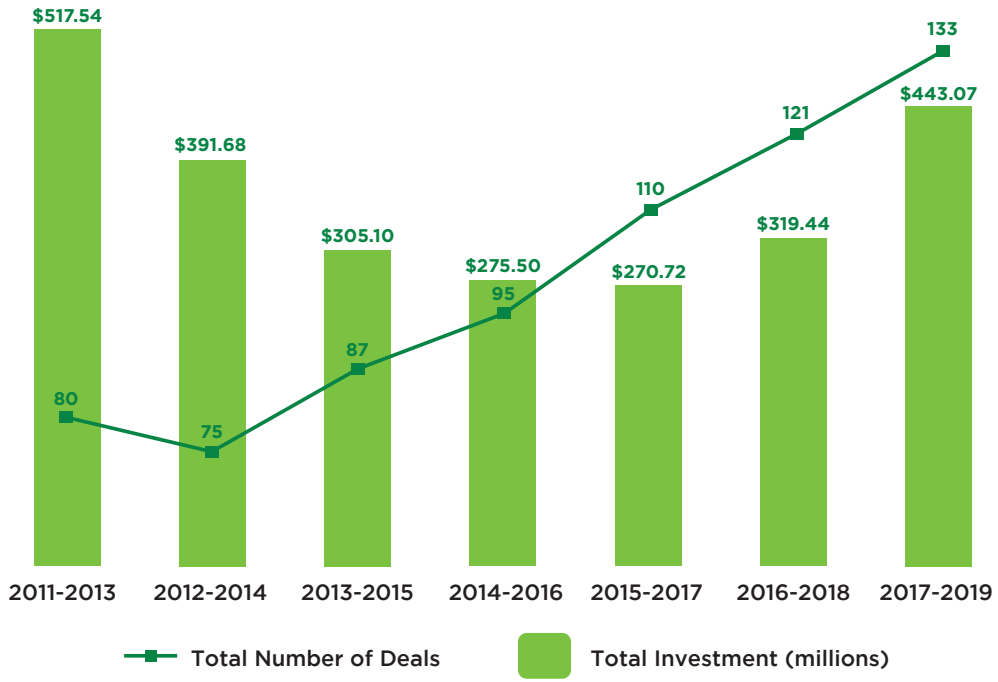
[18] Union employment rate: https://tinyurl.com/y5tuzses

[19] Veterans employment: https://tinyurl.com/y4a6r58s

	2020 Clean Energy Report Employment	Percent of 2020 Report Clean Energy Workforce	Percent of 2019 MA Overall Workforce
Hispanic or Latinx	19,027	16.7%	11.9%
Black or African American	8,869	7.8%	8.8%
Asian	10,037	8.8%	6.9%
Two or more races	9,974	8.8%	2.4%
Women	33,865	29.7%	51.5%
Veterans	12,039	10.6%	3.5%
Workers over the age of 55	15,567	13.7%	30.5%
Union	7,933	7.0%	12.0%

TOTAL CLEAN ENERGY INVESTMENTS

In recent years, clean energy investment funding and the number of investment deals have been growing.[20,21]

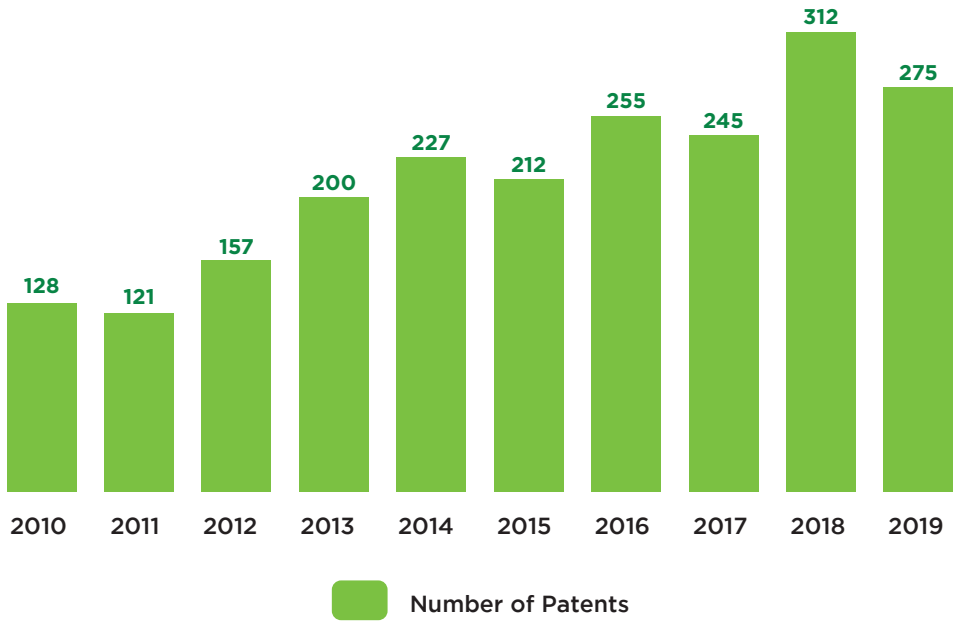


[20] Sources include ARPA-E, The SunShot Initiative, SBIR and STTR, MassCEC investments and innovation grant funding, the Office of Science, and the Crunchbase database.

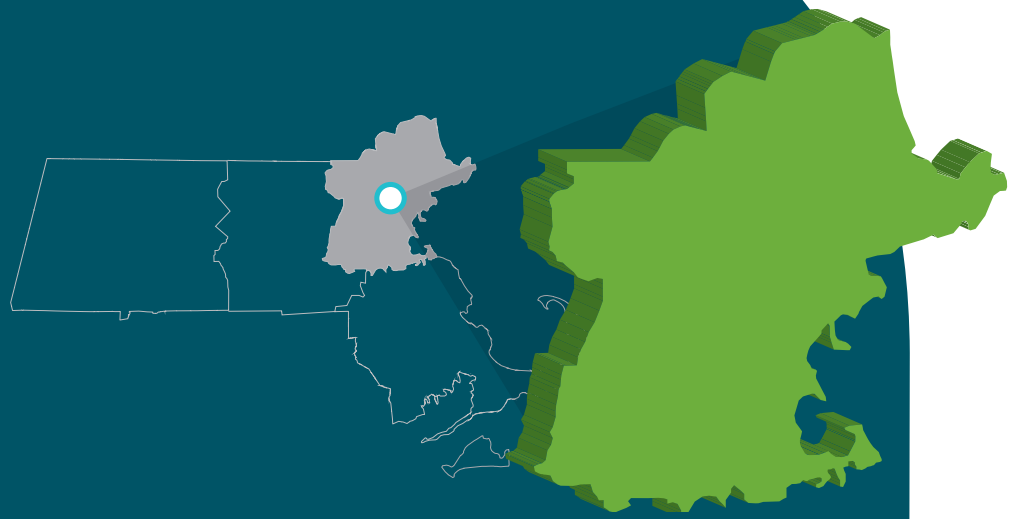
[21] Investments data may differ slightly from previous years based on routine updates to the underlying datasets.

NEW CLEAN ENERGY PATENTS

Patents across time are a helpful proxy for innovation. Clean energy patents in Massachusetts have increased by nearly **115%** since 2010, though more recently experienced a **12%** decline between 2018 and 2019. Alternative transportation related patents comprised the majority of 2019 patents, at **39%**.[22]

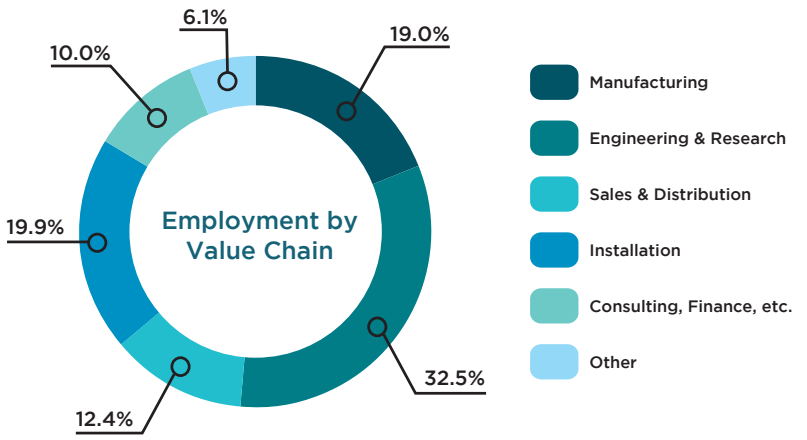


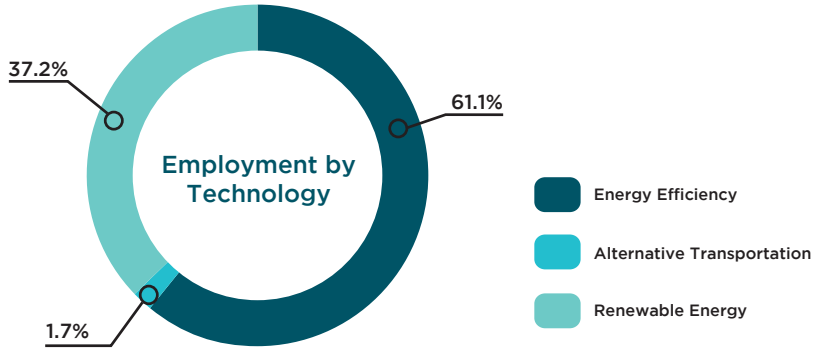
[22] PatentsView. United States Patent and Trademark Office



NORTHEAST REGION

The Northeast region employs over **48%** of clean energy workers and is home to over **46%** of clean energy businesses. Roughly **33%** of the clean energy jobs in the region are in Engineering and Research and **37%** are in Renewable Energy.



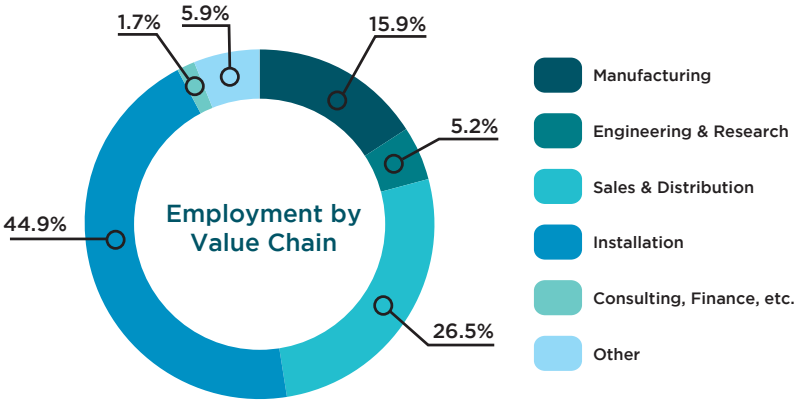


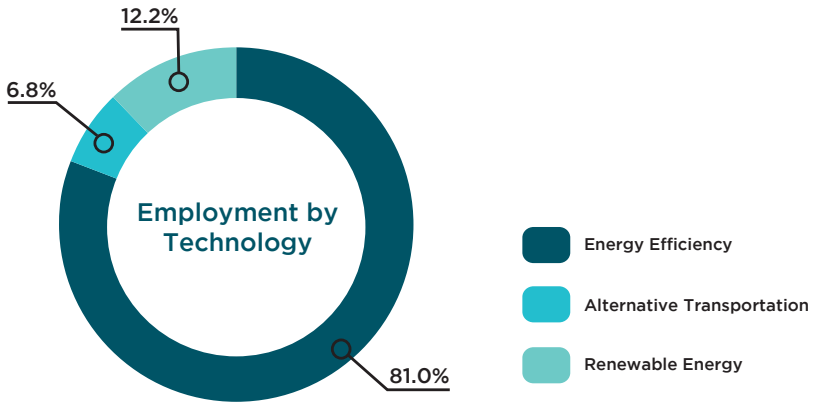
CHANGES IN NORTHEAST REGION, 2019 REPORT TO 2020 REPORT

	2019 Report	2020 Report	% of 2020 Clean Energy Total	2019-2020 Report Growth	2020 Report Numbers per Total Jobs/Businesses in Region
Employment	53,940	55,236	48.5%	2.4%	2.5%
Businesses	3,337	3,321	46.3%	-0.5%	2.9%

CENTRAL REGION

The Central region employs the largest percentage of clean energy employees and businesses, relative to the total number of jobs and businesses in the region, at **4.6%** and **4.2%** respectively. The region has the highest percentage of its clean energy workers focused on Alternative Transportation, at **7%**, and **45%** of the clean energy jobs are in Installation.



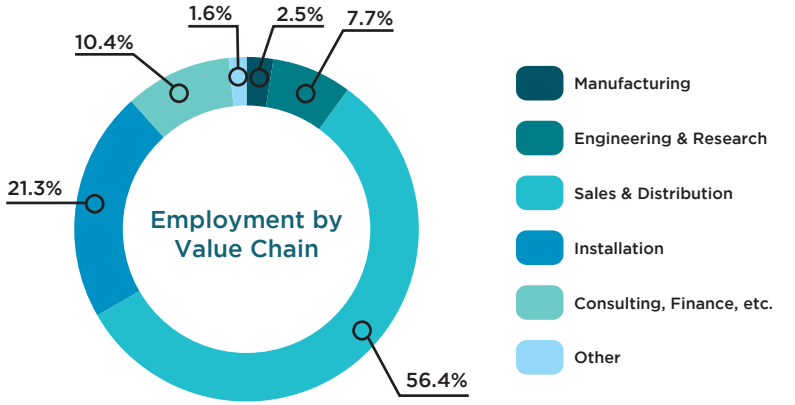


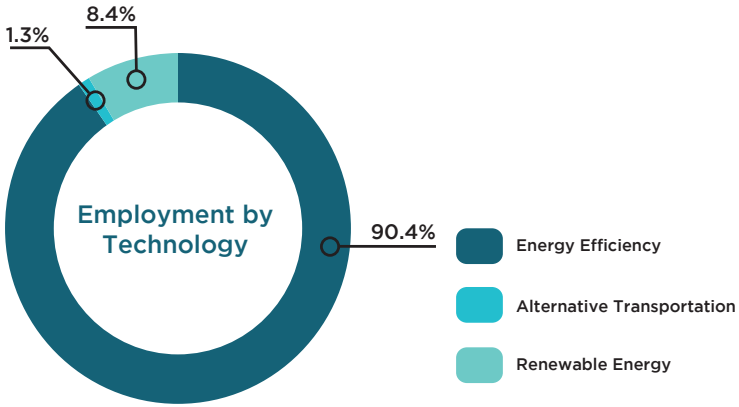
CHANGES IN CENTRAL REGION, 2019 REPORT TO 2020 REPORT

	2019 Report	2020 Report	% of 2020 Clean Energy Total	2019-2020 Report Growth	2020 Report Numbers per Total Jobs/Businesses in Region
Employment	18,259	18,344	16.1%	0.5%	4.6%
Businesses	1,174	1,111	15.5%	-5.4%	4.2%

SOUTHEAST REGION

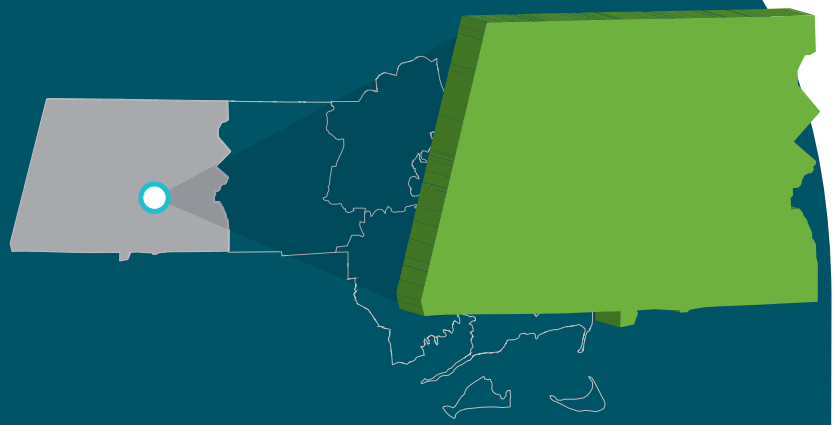
The Southeast region saw the highest rate of clean energy job growth at **2.7%**. Over **56%** of clean energy jobs are in Sales & Distribution and **90%** of jobs are focused on Energy Efficiency, Demand Management, and Clean Heating and Cooling.





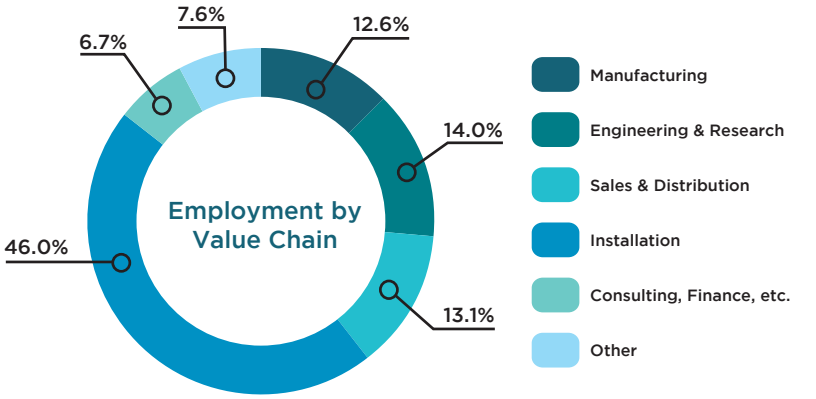
CHANGES IN SOUTHEAST REGION, 2019 REPORT TO 2020 REPORT

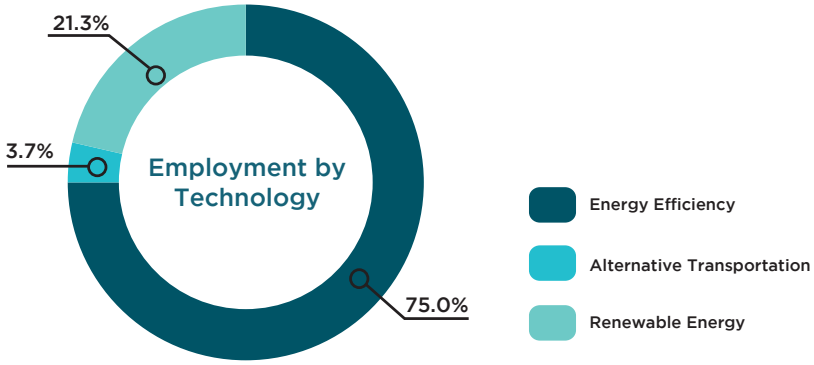
	2019 Report	2020 Report	% of 2020 Clean Energy Total	2019-2020 Report Growth	2020 Report Numbers per Total Jobs/Businesses in Region
Employment	26,295	27,001	23.7%	2.7%	2.7%
Businesses	1,788	1,694	23.6%	-5.3%	2.3%



WESTERN REGION

The Western region had the second highest percentage of clean energy jobs and businesses relative to total jobs and businesses in the region, at **3.2%** and **3.3%** respectively. Installation jobs represent **46%** of the clean energy jobs, and **75%** of jobs are focused on Energy Efficiency, Demand Management, and Clean Heating and Cooling.





CHANGES IN WESTERN REGION, 2019 REPORT TO 2020 REPORT

	2019 Report	2020 Report	% of 2020 Clean Energy Total	2019-2020 Report Growth	2020 Report Numbers per Total Jobs/Businesses in Region
Employment	13,342	13,387	11.7%	0.3%	3.2%
Businesses	1,079	1,053	14.7%	-2.4%	3.3%

METHODOLOGY

The Massachusetts 2020 Clean Energy Industry Report uses publicly available data from the 2020 U.S. Energy and Employment Report (USEER)[23] on Massachusetts energy employment produced by BW Research Partnership for the Energy Futures Initiative (EFI) and the National Association of State Energy Officials (NASEO). These public data are refined and customized for Massachusetts based on additional analyses conducted on behalf of the Massachusetts Clean Energy Center by BW Research Partnership.

The 2020 USEER survey in Massachusetts resulted in more than 10,300 calls, 1,200 letters, and about 2,380 emails, with 667 businesses participating in the survey. These responses were used to develop incidence rates among industries as well as to apportion employment across various industry categories in ways currently not provided by state and federal labor market information agencies. The margin of error is +/- 4.96 percent at a 95 percent confidence level.

The COVID-19 related clean energy jobs data was also provided by BW Research.[24]

See the Methodology for more details on the 2020 Massachusetts Clean Energy Industry Report.[25]

[23] The full 2020 USEER report can be found at: www.usenergyjobs.org/

[24] bwresearch.com/covid

[25] The full Methodology can be found at www.masscec.com/2020-massachusetts-clean-energy-industry-report

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